Robbo Holleran
Forester

211 Green Mountain Tpk Chester, VT 05143 (802) 875-3021 Fax: 875-2337
Providing a complete forest management service since 1982

Phil Giudice, commissioner
Mass DOER
100 Cambridge St. #1020
Boston MA 02114

July 7, 2010

Dear Mr. Giudice,

I have been a consulting forester in southern Vermont for the past 28 years, and am applying for a forestry license in Massachusetts (fully certified in New York). I am a graduate of University of Maine at Orono (B.S. Forest Management, 1982). I am also a director of the Northeast Regional Forest Foundation and the Vermont Forest Products Association, and president of the Vermont Forestry Foundation. I currently manage about 35,000 acres mostly in southern Vermont, but also some in each adjacent state.

I have read with interest the Manomet biomass study, and I find a number of biases and problems with it. I'm sure you have had to get a quick education in forestry language to interpret the report and the comments. I will try to organize these thoughts in paragraph form:

They emphasize the total amount of sequestered carbon in the forest instead of the rate at which atmospheric carbon is changed into biomass. This is always going to lead to the conclusion to "cut less and cut less often", as promoted by Bill Keaton of UVM, who they cite authoritatively. Bill Leak, on the other hand, with more than 50 years of research on the function of local forest ecosystems, has minor citations about irrelevant details, like the number of seedlings required to regenerate northern hardwoods. A quote from Dr. Leak, to be brief, is "Good forest management is good carbon management" I would think it prudent to have a sit-down interview with Dr. Leak to get his perspective on these issues, as he is a leading authority on the function of northeastern forests. You should also be familiar with a report titled "Bioenergy and Greenhouse Gasses" by Dr. Gregory Morris of Berkeley CA, in 2008. This is a major work that comes to very different conclusions than the Manomet study. Interestingly, they give Morris a brief citation as a "regional" study of no consequence, so they know it exists and chose to ignore it. This is the summary conclusion from the Morris report:

"Bioenergy production reduces atmospheric greenhouse-gas levels by enhancing long-term forest-carbon sequestration and by reducing the greenhouse-gas potency of the carbon gases associated with the return of biomass carbon to the atmosphere that is an intrinsic part of the global carbon cycle. These greenhouse-gas benefits are provided in addition to the benefit common to all renewable energy production of avoiding the use of fossil fuels. The value of the greenhouse-gas offsets that are expected to become available in the next several years should improve the competitiveness of energy production from biomass and biogas resources in the marketplace of the future."

Morris further states "The results and conclusions are applicable to the greenhouse-gas implications for biomass and biogas energy production across the country and beyond."

The whole stand analysis from the Manomet study is based on faulty premises. In each case, they take a "one time" harvest approach, and then grow the stand for 100 years with no further entry. All of your Chapter 61 lands, along with other tax-stabilization programs in adjacent states require repeated entry and ongoing management. The state forest lands that are actively managed (I realize that is a contentious issue currently) are subject to management plans for ongoing management, and most private lands, even in the absence of active forest plans, have repeated entries. I realize this is very difficult to model with any computer program, but it is a serious flaw with the study. They seem to despise the "sawtooth curve" of regular forest management, which is actually the norm, rather than the exception. By this I refer to the graph of timber volume, or sequestered carbon, which rises to some point with forest growth, is dropped abruptly by a harvest to some level, and then rises again until the next harvest. With a 15 year cutting cycle, this graph will have 6 "sawteeth" over their 100 year planning horizon. Their summary to chapter 5 states that the "BAU light harvest" increases the growth rate for about ten years, and then levels off. That explains why we re-enter the stand every 10-20 years.

The whole premise of forest management is based on various philosophical views of these sawtooth curves. Do we grow to the A-line, and cut to the B-line? Do we cut more frequently and either grow to halfway between A and B to maximize growth rates, or grow to the A-line to maximize stocking levels? Do we cut less frequently and perhaps down to the C-line to maximize volume per harvest? What are the exceptions to these philosophies? How do we ensure proper regeneration by controlling daylight, disturbance, and minimizing stand damage? How do we deal with other regeneration problems like deer browse and invasive shrubs? What are appropriate applications of even aged, two aged and uneven aged management, and what are appropriate group sizes for uneven aged management? Real life forest management is far more complex than their computer analysis has even attempted to replicate.

To maximize <u>rates</u> of carbon sequestration is relatively simple though, and mostly ignored in the study. These are the same growth curves to maximize timber growth rates that have been used for decades. They do not need to be re-invented by a new generation. The solution for each stand is relatively heavy cuts, to the B-line or below, allowing growth to half-way between A and B lines, or perhaps 70% above B line before the next harvest. On a forest level, balancing the age class distribution toward younger classes with relatively short rotations will maximize growth rate and carbon sequestration rate. And just to get extreme, if we really wanted to maximize carbon sequestration rates, we should be converting to hybrid *Populus* spp., or softwood plantations on short rotations. They have a bias that wants to extend rotations and minimize cutting.

The Manomet study ignores the "carbon neutral" status of unmanaged forests, in terms of rate of sequestration (close to zero), and they are not able to show rates of decline in unmanaged stands. Their curves all go out to a nice flat spot. In real life, many stands reach some maximum stocking, and then as the overstory declines, total stocking is reduced before understory stems accumulate. This is exacerbated by events such as defoliation, disease, and ice or wind storms. This would almost certainly occur in most stands over their 100 year planning horizon. Their stand analysis always shows a steady accumulation to some maximum, which is a serious bias. The whole management philosophy of the Quabbin

Reservoir land is to reduce the exposure of the forest to these extreme events. Along a similar line, Massachusetts has some forest types that are exposed to risk of fire, which is a disaster from a carbon management approach. Biomass harvesting is an exceptional tool for managing forests to reduce risk of fire and maintain fire-prone ecotypes.

A better approach than measuring the stored carbon in the forest would be to look at the amount of carbon in the atmosphere. This is somewhat looked at in Chapter 6 of the Manomet study, but this chapter falls short as well. Burning coal, for comparison, yields a steady, measurable increase in atmospheric carbon as fossil carbon is released. Harvesting woody byproducts in the course of normal forest management, and converting them to energy, even by relatively inefficient processes has huge carbon benefits by increasing the subsequent forest growth. Even converting additional forest stocking (not just by-products) into biomass energy will have a net carbon benefit as long as the site is regrowing to trees. If there is any net accumulation of atmospheric carbon from biomass harvesting, it would be on the order of the one ton of diesel fuel needed to harvest and transport 100-200 tons of forest biomass.

In Chapter 6 of the Manomet study, they attempt to look at this scenario, but again with a one-cut approach and regrow the stand for 100 years. They show a “break even point” at 32 years, with no growth for the first 5 years and very slow growth for the last 50 years. Our experience shows that moderate whole-tree harvests (30-50% of the standing volume) are ready for re-entry in 15-25 years, with a rapid growth response the first year, and growth rates tapering off after the stand reaches halfway between the A and B line. These repeated harvests maintain the rapid growth rate, and C sequestration rate, so over the 100 year planning period there would be 4-6 harvests of a similar magnitude. This will replace 4-6 times the amount of coal over that period, which changes the dynamics dramatically. The Manomet study shows it taking 75-100 years to regrow the biomass to the original level.

A graph of this approach, on a landscape level, would compare the continually rising atmospheric carbon from burning coal and compare that to the hundreds of reverse-sawtooth (atmospheric carbon will follow an inverse curve from standing timber sawtooth) graphs of various forest treatments, in different stands, over time. These “reverse-sawtooths” will even out overall, perhaps with some delay but not nearly as drastic as they state. This will have to be at a far lower CO_2 level than burning coal every year. Increasing the harvest will increase the growth rate in these forests, which Manomet alludes to. For 1/10 of what Manomet was paid, I could enumerate these graphs, but as an interested citizen, I only have time to offer these comments…

The economic analysis of wood supply is also somewhat flawed. A small increase in stumpage price paid to the landowner will greatly increase the available wood. This is directly from my experience as a forest manager. Trucking cost and distance to the market is a main factor in stumpage rate, so having additional facilities dispersed through the region will automatically increase the effective stumpage rate. Since Massachusetts is far from traditional pulp markets, and firewood demand cannot come near to actual forest growth rates, a huge percent of forest growth can be economically allotted to a biomass market. I personally live in Chester, Vermont, in Windsor County. If there were a biomass plant in Greenfield paying a similar price for chips as the plant in Ryegate Vermont, there would be a tremendous amount of wood available from parts of our 4 southern counties. I’m sure this would affect wood supply options even further to the south. But increasing delivered price by, say, $4 per ton, could easily double the stumpage rate from $2 to $4 per ton, which will increase the supply dramatically.

The Manomet study takes care to mention, and possibly overstate, every potential negative effect of biomass energy (aesthetics, biodiversity, water quality, and potential soil productivity), including social considerations which are outside of their study parameters; with the briefest mention of only a few of the positives. I notice they make no mention of any of the other negative consequences of using fossil fuels, and the whole thing almost sounds like an advertisement for the coal industry. One social benefit they did not mention is that the money for the energy resource would stay within the state and region.

At this point, I would like to comment about the forest practices, one of the major positive effects. (Which they state as a negative.) Much of the forest in this region is the result of pasture abandonment over the last 150 years. It has mostly been affected by high-grading or diameter limit cutting, and a large proportion is near or beyond effective rotation age. Conversion to true uneven aged management is rare. Harvesting rates are well below actual growth rates, on the order of 20% in Massachusetts. This results in overstocked forests with slow net growth rates, high mortality rates, a high proportion of unacceptable growing stock or marginally poor growing stock. It is also more susceptible to damaging agents such as insects, disease, fire and storms. Additional harvesting is a solution to these problems, as long as it is not additional high-grading. Biomass prices are, by nature, low enough to discourage harvest of high quality immature growing stock, or chipping of anything better than a pallet log. With the absence of alternative low grade markets (I don't think anyone is proposing to build any new paper mills in the Commonwealth, and other alternative low-grade markets are not amounting to much.) biomass markets should be seen by all of the forestry community as a huge benefit to forest management and forest health in your region. Increasing the harvest rate dramatically, without high-grading, will also increase the net growth rate of the forest by a similar measure. Net growth rate could easily be doubled by more aggressive forest management.

I'm not sure how the DOE is affected by the negative perception of clearcutting, and the public campaigns of various anti-harvesting groups, but this is worth a mention. When you take a wide-angle photo of a 3 acre clearcut from ground level, it looks pretty ugly. But it is not environmental degradation. I am active in utilizing whole tree harvesting and biomass markets on small private ownerships in Vermont. Clearcutting is a seldom used technique in these forests, even with biomass markets nearby. As a forestry technique it is limited to existing monocultures (usually plantations of pine or spruce), severely high-graded or storm damaged stands, and wildlife habitat cuts. If you tour Sweden on 'Google Earth', you will see that small clearcuts of 2-20 acres are a very common practice in a country known for its innovation and high level of intensity of forest management. In a philosophical sense, there should be a lot more clearcutting to balance our age class deficits, provide early successional wildlife habitat, and increase biodiversity.

How dare I say that? Overall, northeastern forests are accumulating late-successional species such as sugar maple, hemlock and beech. This is partially because we are harvesting well below growth rates, and most cutting is small group selection, high-grading or other light intensity harvesting that favors shade tolerant regeneration. We are losing pine, poplar, birch, cherry, and butternut. These species do not regenerate effectively in low-light environments of various selective cutting regimes. Large group cuts, heavy shelterwood cuts and clearcuts are required to regrow new seedlings of these species. Biomass harvesting is one of the best tools to achieve these objectives, which will increase the tree-species diversity of these forests. Structural forest diversity is increased by the variable-retention techniques commonly applied with whole-tree harvesting. Horizontal diversity is maintained more-or-less by the mosaic of ownership patterns in New England, and is enhanced by scattered heavy cuts mixed with relatively uncut ownerships, which will be common. The report spends a great deal of time on retention of woody debris and standing dead snags as important for biodiversity. A look at real-life whole tree harvesting will show that this is not an issue either. A large portion of the woody debris is routinely left on the ground with already fallen stems, branches that break off, etc. It is estimated that only 2/3 of the biomass is removed even in clearcutting. Most landowners would be glad to retain standing snags, unless they are managing for game birds. Standing dead trees provide a tremendous benefit to birds of prey, and some landowners prefer to manage for game birds. And the larger snags are the most valuable for wildlife in general, and most contractors are not glad to cut them over 22", or whatever their feller-buncher can handle in one pass.

The benefits to wildlife are also worth mentioning further. Most of the actual clearcutting that I am involved with, on small privately owned woodlots, is specifically directed at improving habitat for wildlife. The new growth of trees, raspberries and herbaceous plants that provide food and cover is not available in adjacent middle aged or mature forests, or even small-group cuts. The sound of the chain saw or feller buncher is the dinner bell ringing for most of our forest wildlife. Everything in the forest either eats raspberries, or the critters that eat raspberries.

But this brings up a related point. Manomet talks about "protecting all the ecological value of the forested ecosystem". We make choices all the time, weighing the positive and negative aspects against our values. One landowner might cut 2 acre patches to benefit grouse, even if it means harvesting trees that have not attained a timber objective. Another landowner might grow sawlogs to large diameter, and forgo the benefits to grouse. Another may harvest hardwoods to benefit softwoods, or vise-versa. Some may clearcut and some choose not to cut at all. Each has ecological and economic consequences, problems and benefits, and there is no alternative that protects every ecological value. The mosaic of ownership is the best protection of your forest diversity; and the maintenance of the economic benefits of long term forest ownership is the best protection of forest stewardship. Stable tax policies and regulation that encourages growth in the forest products economy will actually slow down the rate of conversion to non-forest uses.

Soil productivity is also mentioned as a possible negative affect. First I would like to say that if the soil is growing unacceptable growing stock, then the productivity (of the forest) will be greatly enhanced by replacing that forest with new regeneration. But this usually refers to soil nutrients, particularly calcium, and the potential for depletion. Most of the studies are done by computer modeling of what might happen, and make estimates of leaching, weatherization of soil minerals, and nutrient removals in extreme clearcutting, which is not the norm as mentioned. Manomet cites some of these studies and notes the variety of conclusions. There is only one study that I know of that actually measured soil chemistry before and after whole tree harvesting for an extended period. It is reported in "Longterm Trends from Ecosystem Research at the Hubbard Brook Expt. Forest", by Campbell et al, 2007, General Tech. Rept. NRS-17, USFS Northern Research Station. They clearcut a whole watershed at Hubbard Brook, removing all the biomass in a way far more intensive than operational clearcutting, and concluded that "whole-tree harvesting does not appear to have much of an influence on this nutrient reserve". This was compared to several other watersheds with various harvest intensities including no-cut controls. This was cited in the Manomet study, but not part of their conclusion.

The Manomet study expresses concerns over the “long term health of the wood products sector of the economy”. This expresses an ignorance of the integrated nature of the marketplace in forest management. Since Massachusetts has limited sawmilling capability, and very limited markets for low-grade wood, high-grading is all that is feasible in some instances. Many sawlogs are exported to mills in states to the north, Canada and worldwide (for the highest quality logs), which they mention. What pulp is sold has to be trucked long distances, at little profit. So a landowner who desires to improve the quality of his growing stock has fewer options, and as he sees local mills shut down, can become dissuaded for long-term management. Local markets for the low grade will encourage management of these forests, and will also produce sawtimber that may help local mills stay competitive. Also, it allows a landowner to at least break even on removing low quality wood which expands the growing space (increasing growth rates) for quality stems. It takes effective markets for the whole range of forest products, and competition between these markets, to provide the dividend to forest landowners, that allows them to keep a family forest for another generation. Manomet makes a brief mention of this possibility, but expounds greatly on the negative possibilities. Increasing the low grade harvest will produce additional sawlogs in the short term, which may benefit some local mills, and help keep them in business; along with improving the quality of the future harvest for the next generation.

The modeling analysis was done using NE TWIGS, which is considered to be fairly reliable for short term (5-10 years) growth prediction, but its reliability drops off dramatically for longer term analysis. It is very sensitive to site index variables, which are important to Massachusetts forestry with variable glaciated soils. They held this as a constant in the modeling, which is a huge flaw. NE-TWIGS is not reliable for predicting basal area by timber size classes, particularly those for medium and large sawlogs. In over 51% of stand projections (in a study in northern hardwoods in southern Ontario), the predicted diameter distribution is significantly different from the actual distribution, primarily due to the ingrowth function. To quote the conclusions in Chapter 5, “The NE TWIGS model has known limitations, but generally reflects what we know about trends in forest dynamics”. This is a clear example of “after the fact” reasoning, which sheds a shadow of doubt on all their fancy graphs and tables.

Operationally, I would like to make some comments about any proposal to further regulate the supply of biomass, specifically any formal approval of each harvest. Biomass is the lowest value product, and adding any expense to the approval process provides a disincentive to good forest management. I work in 4 northeastern states, and the Commonwealth already has the most restrictive process in which I work. This adds at least $1000 to the cost of any operation, and adds weeks to the timing of starting a project. In Vermont, I can do a small-scale improvement cuts that essentially break even, and the landowner has an improved woodlot with no cost. To add another $1000 of costs means that another load of prime hardwood or two loads of pine or spruce have to be cut before the landowner breaks even. So it is already too difficult to do real nice forest improvement in

Massachusetts without cutting more "good stuff" than we have to in adjacent states. (Connecticut is worse, but that is another story…) You already have Chapter 61 plans in place. I would recommend that anything approved in a Chapter 61 plan be exempt from further red tape. You already have Chapter 132 for approval of any commercial timber harvest, and this is more than adequate to protect water quality and other important values. Since the range of ecological values is broad and subjective, trying to make regulations that serve to protect every aspect will be very difficult to use. The result will be to favor the largest operations (larger acreage cuts and heavier cuts) that can afford to jump through all the hoops. This is the case with California's harvest restrictions. Any approval process will be further complicated by land conversion for development or farming, by-products from sawmills, out-of-state wood, and the occasional loads from arborists or other waste wood.

In summary, I would like to look at their policy questions that they suppose to be answering:

#1 What are the atmospheric greenhouse gas implications of… forest biomass (use)?

They mostly consider standing carbon levels in the forest, rather than looking at the rates of change of atmospheric carbon, and the conclusions are completely based on computer modeling with false assumptions and known limitations.

#2 How much wood is available from forests to support biomass energy development in Mass.?

They have major flaws in their view of landowner values and the operation of the wood products marketplace, in Massachusetts and the region.

#3 What are the potential ecological impacts of increased biomass harvests on forests in the Commonwealth, and what if any policies are needed to ensure these harvests are sustainable?

They take great pains to overstate anything potentially negative, without mention of the known or potential benefits.

I hope you will not weigh the Manomet study heavily in policy making, and I would be glad to provide further input if I can be of any help.

Respectfully submitted,

Robbo Holleran